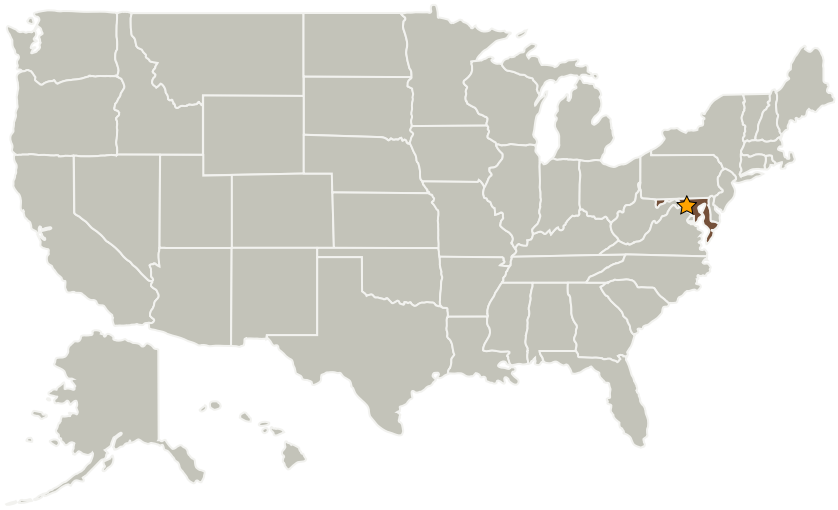
Compact, Low Cost APD Arrays with Built-in Optical Amplification, Phase II

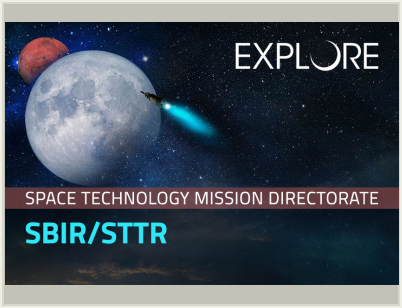
Completed Technology Project (2004 - 2006)

Project Introduction

The overall goal of this proposed Phase II SBIR program by Epitaxial Technologies is to develop a compact, low-cost, low power, low noise and ultra-sensitive avalanche photodiode (APD) arrays with built-in optical pre-amplification (in addition to internal electrical gain) and having a fill factor and bandwidth of 90% and 5.0 GHz respectively. In Phase I, we established the feasibility of the concept by demonstrating APDs and APDs with built-in optical amplification with 3 GHz bandwidth and estimated NEP of 1 nW. In Phase II, we will build on these results and optimize the novel APD structures and the APD/optical amplifier integration process. To do this, we will design, model and simulate the performance of the APD arrays with built-in optical pre-amplification and optimize the fabrication process for array production. . In particular, a hybridization technique will be developed to integrate the arrays with readout integrated circuits (ROIC) using an innovative bonding technique at the wafer level. Further, we will design, fabricate and test 1 x 16 datacomm photoreceiver arrays with -52 dBm sensitivity at 1E-9 BER and 2.5 Gbps, along with 32 x 32 imaging ladar arrays with 1 pW NEP that are capable of true photon counting.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Epitaxial Technologies, LLC	Supporting Organization	Industry	Baltimore, Maryland

Primary U.S. Work Locations
Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes